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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No: 09/768,845 ✓ Docket No: 2011001
Filing Date: 01/23/01 Applicant: HO et al. ✓
Examiner: LUAN THAI Art Unit: 2827
Title: PACKAGING STRUCTURE OF IMAGE SENSOR AND
METHOD FOR PACKAGING THE SAME ✓
To: THE ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

RESPONSE TO OFFICE ACTION

Dear Sir:

In response to the Office Action dated 01/30/2002, Applicant submits the following amendments and remarks.

AMENDMENTS

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 1, line 5, with the following rewritten paragraph:

10 -- The invention relates to a packaging structure of image sensors and method for packaging the same, and in particular, to a packaging structure in which a substrate for carrying an image sensing chip is formed using plastic materials and the substrate includes metallic pins, thereby lowering the manufacturing costs. --

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Please replace the paragraph beginning at page 4 line 14, with the following rewritten paragraph:

20 -- The substrate 10 includes a plurality of straight metal sheets 16 directly penetrating through the substrate, glue 18 for sealing the metal sheets 16, a first surface 20, and a second surface 22. Referring to FIG. 2, the method for manufacturing the substrate 10 includes the following steps. First, adhere the plurality of metal sheets 16 onto a tape 24. Next, place the tape 24 on a mold (not shown). Then, pour the glue into the mold, the glue can be a plastic material such as epoxy mold compound, BT, FR4, FR5, PPE, or the like.

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5 Thereafter, tear the tape 24 to complete the manufacturing processes of the substrate 10, as shown in FIG. 3. At this time, the metal sheets 16 are exposed to the outside via both of the first surface 20 and the second surface 22 of the substrate 10, respectively, in order to form first contacts 26 and second contacts 28 on the substrate 10. Alternatively, a projecting edge 30 is formed around the first surface 20 of the substrate 10 in order to form a concavity 32 for containing the image sensing chip 12. The projecting edge 30 can be integrally formed with the substrate 10. Optionally, the projecting edge 30 also can be made of plastic materials, and then, the projecting edge 30 is adhered onto the substrate 10.

10 Thus, the transparent layer 14 can be placed on the projecting edge 30 in order to seal the image sensing chip 12 which can receive optical signals. --

IN THE CLAIMS:

Please amend claim 1 as follows:

- 15 1. (Amended) A packaging structure of an image sensor, comprising:
- a substrate including a plurality of straight metal sheets directly penetrating through the substrate, glue for sealing the metal sheets, a first surface having a periphery, and a second surface opposite to the first surface, the metal sheets being exposed to the outside via the first surface and the second surface to form first
- 20 contacts and second contacts, respectively;
- a projecting edge provided on the periphery of the first surface of the substrate to form a concavity above the substrate;
- an image sensing chip mounted on the substrate and within the concavity, a plurality of bonding pads being formed on the image sensing chip;
- 25 a plurality of wirings electrically connecting the bonding pads of the image sensing chip to the first contacts of the first surface of the substrate in order to electrically connect the image sensing chip to the substrate, so that electrical
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signals from the image sensing chip are capable of being transmitted to the second contacts of the second surface of the substrate; and
a transparent layer arranged on the projecting edge on the first surface of the substrate so that the image sensing chip is capable of receiving optical signals.

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Please amend claim 6 as follows:

6. (Amended) A method for packing an image sensor, comprising the steps of:

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10 preparing a substrate including a plurality of straight metal sheets directly penetrating through the substrate, glue for sealing the metal sheets, a first surface having a periphery, and a second surface opposite to the first surface, the metal sheets being exposed to the outside via the first surface and the second surface to form first contacts and second contacts, respectively;

15 providing a projecting edge on the periphery of the first surface of the substrate to form a concavity above the substrate;

mounting an image sensing chip having a plurality of bonding pads onto the first surface of the substrate and within the concavity;

connecting the bonding pads of the image sensing chip to the first contacts of the first surface of the substrate by a plurality of wirings; and

20 mounting a transparent layer on the projecting edge located on the first surface of the substrate in order to cover the image sensing chip.

REMARKS/ARGUMENTS

25 The paragraph beginning at page 1, line 5 has been amended to meet the grammar requirement.

In order to distinguish the invention from the cited prior arts, the paragraph beginning at page 4, line 14 has been amended to specifically describe the

invention according to the features that have been illustrated in the drawings. Thus, no new matter has been added.

Claims 1-11 remain in this application. Claims 1 and 6 have been amended.

Claim 6 have been amended to overcome the claim rejections.

5 Claims 1 and 6 have been amended for the following reasons:

The metal wires (metal sheets) 222 in Chou's Patent are the so-called "C-shaped pins" described at page 1, lines 10-11 of this application. Therefore, the metal wires 222 cannot be easily formed, and have the drawbacks such as increasing the signal transmission distances and adversely influencing the signal transmission effects, which have been described in pages 1-2 of this application. In addition, the inner leads (metal sheets) 61 in Yamanaka's Patent are formed into Z-shaped leads in a given pattern. Compared to the processes for forming the straight metal sheets of this application, the processes of forming the Z-shaped leads 61 are more complicated. In this application, the metal sheets are arranged on a tape, and the substrate with the metal sheets is formed using a mold and the glue for molding. Yamanaka never teaches the usage of a tape to form the substrate. Even though the Z-shaped sheets are used in this application, it is difficult to arrange the Z-shaped sheets in a given pattern precisely and quickly. The Z-shaped sheets may be inclined owing to the gravity force before the glue is poured. In addition, cavities may be easily formed in the molding process if the properties of the glue are not precisely controlled. Furthermore, the Z-shaped sheets also cannot be easily formed and have long signal transmission distances and poor signal transmission effects.

20 The metal sheets used in this application are defined to be straight metal sheets directly penetrating through the substrate. The features have already been illustrated in the drawings and thus no new matter has been added. The straight metal sheets in this application can be easily formed and can decrease the signal transmission distances and improve the signal transmission effects. Therefore, the structure of this application has not been taught or motivated by the cited prior arts.

30 Attached hereto is a marked-up version of the changes made to the

specification and claims by the current amendments. The attached page is captioned "Version with markings to show changes made."

In light of the above amendments and remarks, Applicant now asserts that all of the grounds for rejection have been traversed or overcome by amendments, and that all of the present claims are in condition for immediate allowance. Applicant therefore requests reconsideration of the objections and rejections, and solicits allowance of the present claims at an early date.

Thank you for your consideration.

Respectfully submitted,

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